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REMOTE AUTOMATIC MULTIPURPOSE STATION

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FINAL TECHNICAL REPORT

Remote Automatic Multipurpose Station

Prepared by

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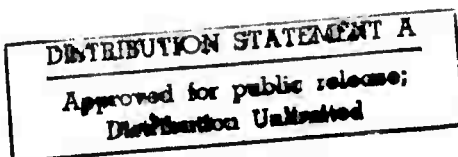W. P. Brown
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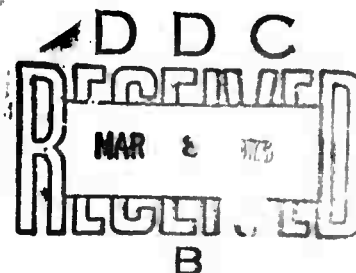Earth Sciences Division
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SUMMARY

Technical Problem

After two decades of broad spectrum scientific research by the U.S. in the Arctic Ocean and peripheral seas, the need for remote automatic stations to collect data has become obvious. The reasons for this need are:

- the geographic and seasonal variability with consequent need for spatial and temporal sampling

- the limits, dangers and cost of manned ice station employment.

The problem, then, is to develop an unmanned station that can be: easily deployed; collect satisfactory data without human presence; reasonably inexpensive; have a useful life; and be adaptable to a wide variety of input sensors.

It is interesting to note that the USSR recognized this problem in the early 1950s and developed the DARMS (Drifting Automatic Radio Meteorological Stations). They have successfully used hundreds of these remote stations for data collection in the Arctic.

General Methodology

A study was conducted to determine the best approach to the system which was called LORAMS (Long Range Automatic Measuring Station). The basic concept that was derived employed a HF telemetry link, a digital recirculating memory to store data during polar HF blackouts, and a power supply. The design goals were for one year unattended life and a 1000 n. mile effective range. The above study was accomplished prior to the funded project. The funded contract consisted of a three-phase project, outlined below:

Phase I   Design and testing of the basic telemetry system.

Phase II   Memory module design, construction and field testing. Design and fabrication of a data logging system. Fabrication and installation of a second LORAMS station at the Naval Arctic Research Laboratory.

Phase III   Navigation system design and fabrication. LORAMS receiver design and long term tests of the LORAMS system on the ice pack.

Technical Results

Only Phases I and II were funded and these have been successfully completed. Phase I was completed 31 March 1972 and Phase II on 31 December 1972. A LORAMS test system was fabricated and tested which:

1. Attained an unattended operation for a period of six months on the ice pack.

2. Operated at a range of 250 to 1000 nautical miles.

3. Contained a flexible memory system capable of storing sampled data from a wide variety of sensors over long periods sufficient to cover any possible communications link outages due to polar cap absorption.

4. Was compact and lightweight enough to be installed by a helicopter, Twin Otter, R4D or other similar aircraft.

DOD Implications

Although LORAMS was conceived as a multipurpose module adaptable to any scientific sensor whose output could be converted to a DC voltage and sampled, one of the most useful employment envisaged was in the collection of underwater acoustic data with application to ASW. Besides having direct application to this function, LORAMS showed promise of being adaptable to a highly cost-effective submarine surveillance system in the Arctic.

Implications for Further Research

The project was dropped before the system was completed. The reasons for the original development are still valid however — with the most serious implications being to the ONR Arctic Acoustics Program. In order to model the Arctic acoustic ambient noise environment to enable predictions of submarine detectability, LORAMS is a necessity.

Special Comments

It is understood that the reason for terminating the LORAMS development prior to its completion was that the project fell within the purview and charter of the National Data Buoy Project of NOAA and that future development, if any, should be carried out through that agency. An attempt will be made to obtain this support for the basic LORAMS development. However, it should be noted that as previously mentioned a high priority usage of LORAMS is for the Navy's ASW scientific program in the Arctic and those data are of a military, and in some cases classified, application. While LORAMS will definitely suit certain requirements for unclassified research, notably Project AIDJEX, the specialized configuration required for military data cannot be expected to be met by NOAA.

Technical Description

The LORAMS system and development is described in detail in the following previously published reports:

- Contract N00014-71-C-0357 Quarterly Technical Reports No. 1, 2, 3 4 and 5

- "A Remote Automatic Multipurpose Station (RAMS)", B. M. Buck and J. O. Anderson, AIDJEX Bulletin #7 Apr 71

- "Two Remote Arctic Measuring System Concepts under Development", Beaumont M. Buck and Walter P. Brown, presented at Arctic Logistics Support Technology Symposium, Hershey, Pa. 1-4 November 1971

- "LORAMS and SHRAMS - Two Unmanned Drifting Data Collection Systems for Ice-Covered Seas", presented at World Meteorological Organization Conference, Tokyo, Japan, 2-7 Oct 1972

- "Electronic Systems for Measuring the Effects of the Environment on Underwater Acoustics in the Arctic Ocean", B. M. Buck, presented the Aerospace and Electronic Systems Conference in Washington, D. C., 17 Oct 1972

- "LORAMS and SHRAMS - Two Unmanned Data Telemetry Systems for Ice-Covered Seas", Walter P. Brown and Beaumont M. Buck, presented at IEEE National Telecommunications Conference in Houston, Tex., 4-6 Dec 1972